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ABSTRACT

This study examined and compared the objectives and points of view found in technology education, technical studies, and courses in technology in selected European countries. The specific countries discussed included France, Greece, Italy, Spain, United Kingdom, and West Germany. Technical education in each of these selected countries is described, and the ways in which the subject is viewed is analyzed in light of several global trends concerning the purpose of technical education. These global trends include: (1) technology and social education: the polytechnic approach; (2) interdisciplinary technology: the project method; (3) technology and people: group work; and (4) technology and disciplinarity: the analytical method. Trends in forms of teaching technology in the countries are also examined: (1) technology as a guiding theme; (2) technology as an end in itself; (3) technology as a subject in its own right; and (4) technology as a form of motivation. (JD)

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TECHNOLOGY EDUCATION IN EUROPE

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> Technology is a means of culture . . . a means of situating oneself in relation to the modern world, in the technical and human aspects which characterize our civilization.
>
> (Payan, 1971, p. 6)

The study of technology education, or some similar title in Europe is a picture of differences as well as a concept that has many obvious or subtle similarities. The appeal of such a study is found in the relationships that may be drawn regarding the purposes and goals of technological education in the countries of Europe.

The word technology plays an important part in such programs. The titles include technology education, technological studies, and courses in technology. It is important to note that each of the European countries has its own system of government as well as a high degree of nationalism. The effort to share and communicate in this area of education related to technology has been

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obvious through the meetings and reports of the Council of Europe for Cultural Cooperation Committee for General and Technical Education and the Workshop for Technology Teacher Training held in Madrid. This latter meeting was for the countries of Southern Europe.

The principal thrust of this study has been to identify and compare the objectives and points of view found in technology education, technical studies, and courses in technology in selected European countries. The task of such an analysis is complicated by the varieties of educational patterns and systems found among the selected countries. Each country has its own plan of organization as well as age and course requirements.

The specific countries included in this discussion will include: France, Greece, Italy, Spain, United Kingdom, and West Germany. Each is an independent nation with its own educational system/s, requirements, and objectives for the respective programs of study.

Deforge, in The Teaching of Technology, (1972) set forth three general purposes for the study of technology that bridged across many of the countries included in this study. These three purposes were:

> To facilitate observation of the students, either individually or in teams faced with a specific problem requiring them to dismantle, reassemble and to create objects of their own design.
>
> To promote guidance, particularly towards technical and scientific education, by arousing positive motivation.
>
> To give both boys and girls the tools to understand the environment in which they live; an introduction to technology, interpreting the diagrams, methodology, and the organization and sociology of work. (p. 2)

There have been indications of a trend towards some form of standardization

of programs among the European countries. This has resulted from exchange programs, Council of Europe symposia, international conferences, and various forms of imitation. (Deforge, 1972, p. 2)

A report of the Committee for General and Technical Education titled "The Teaching of Technology (1972) identified four main trends in purpose and another four trends in forms of teaching.

The trends in purposes were --

1. Technology and social education: the polytechnic approach,
2. Technology and people: group work,
3. Technology and interdisciplinarity: the project method, and
4. Technology and disciplinarity: the analytical methods (Deforge, 1972, p.3)

The trends in the form of teaching the various forms of technology education were identified as follows:

1. Technology as a guiding theme,
2. Technology as an end in itself,
3. Technology as a subject in its own right, and
4. Technology as a form of motivation. (Deforge, 1972, p. 4)

Deforge (1972) in his concluding statement regarding the efforts of the Council of Europe through its Committee for General and Technical Education made the following comment.

> The advent of technical education is a real innovation in the teaching world. It is also something really necessary for there can no longer be any culture without technology. A person who is unable to decipher a technical drawing, express himself graphically, analyze a technical object, or make an informal judgement on the environment in which he lives, is uncultured . . . (p.1)

Technology Education in Selected European Countries. The following section deals with technology education in selected European countries. Their selection was made from a number of countries that participated in the meetings of the Council of Europe for Cultural Cooperation Committee for General and Technical Education. The listing or presentations do not include all of the countries that were involved in such meetings.

France. Technical education in France plays a unique role in its educational system. Such studies are compulsory for students in the first two years of the middle school. It is recognized as a basic school subject with specialized teachers, allocated time for classes, and a curricula related to its specific nature of the studies involved. This position of prominence is described by Deforge (1972) in the following comment.

> In France, technical education is compulsory and generalized in the first two years of the middle school. The fact that it is classified among the "basic subjects" should be stressed. France is the only European country to give technology such a marked place as a school subject, with specialized teachers, set timetables and curricula. (p. 9)

Technology education in France has strong linkage or emphases with physics and mathematics or the broad field of experimental sciences. This is a linkage that has been attempted in selected programs (industrial arts) in the United States. However, it has not (in the United States) become a major thrust in most industrial arts programs. The relevance of this thrust in France is indicated in the following statement by Payan (1971).

> . . . Technology, through its methods of analysis and synthesis, is therefore capable of establishing bonds between physics and mathematics, and awakening the curiosity and aptitudes of pupils to the immense field of experimental sciences. (p. 5)

Another important objective of the area of technological education in France is to bridge the gap between the arts and the sciences. This is a goal

that is aimed at a more uniform as well as national, distribution of skills among the population which is neglected in a society where there are barriers between the arts and the sciences. Payan (1971) describes the unique role that technological education can play in this important effort of bridging between the arts and sciences.

> By its choices, content, context and pedagogy, technology aims to break down the artificial barriers of prejudice between the two cultures -- the arts and sciences -- and we hope thereby to encourage better recruitment for technical education in order to meet the need for a more rational distribution of skills which the nation requires. (p. 7)

Some important elements that one might ascribe to technical education in France would include:

1. It is compulsory.
2. It is a designated subject.
3. It has specialized teachers.
4. It has specific time allocation.
5. It has its own curricula.
6. It attempts to establish bonds with mathematics and science.
7. It attempts to break down the artificial barriers between the arts and the sciences.

Greece. Technology studies or the technology course in Greece is a recent innovation into the educational system in Greece. The effort has been established for the 7th, 8th, and 9th grades and is in the process of development and expansion beyond the initial experimental schools. Paleocrassas and Eliadis (1981) have presented the general objective for the technology course in Greece as follows:

> . . . to develop the mental functions of the student and to train him/her to apply the theoretical concepts which he/she is being

> taught, and not to teach him/her a craft. This way, among other things, enabling him/her to perceive any special abilities and interests he/she may have. More specifically, this subject aims towards the development of those skills which will help the student later on to face the practical needs of life. (pp. 1,2)

There were a number of factors which tended to underline the above objective in establishing the technology course as a part of the educational program in Greece. These factors were listed by Paleocrassas and Eliadis (1981) as follows:

1. The absence from the lower secondary school program of any "hands-on" activity.
2. The need to compensate for the otherwise academic nature of the program and for the traditional method of teaching.
3. The need to prepare all youngsters to function in a society dominated by technology, and
4. The need to prepare the students for the transition from school to life and eventually to working life. (p.2)

The emphases as per the general objectives above and the list of factors underlining such a movement were as follows:

There was a concern for --

(1) an application of the theoretical,

(2) recognition of special abilities and interests,

(3) development of skills for later life,

(4) absence of "hands-on" experience,

(5) compensation for overly academic program,

(6) dealing with traditional educational methodology,

(7) functioning in a technological society, and

(8) transition from school to life.

Italy. The technical studies in Italy reflect a number of interests and concerns for this part of the school program. They extend across the realm of child development to the technical relationships of drawings and illustrations.

The fulfillment of self in activities at all levels are also an important goal of such studies. These ideas have been put into perspective in a statement by Trotta (1971) in which he presents a general description of the purposes of technological education in Italy.

> . . . to satisfy his active interests and develop his ability to identify and define shapes and the relationship between dimensions by means of drawings and diagrams. It also aims at preventing the pupil from falling into the habit of ignoring the functional and aesthetic requirements that are always implicit in any artistic or expressive undertaking, and at giving him some elementary knowledge of materials and tools, their characteristics, qualities and functions. Technical application cannot fail to contribute to harmonious development of the child's personality, enabling him to fulfill himself in a reasoned activity at all sorts of levels that bring into operation a conscious mental process . . . (p. 8)

A more specific listing of goals or purposes for technological education was made by Barbafiera (1980) that tend to focus on a number of relevant dimensions of education in a technological age. These goals or purposes are as follows:

1. To associate subject matter with technical, anthropological, structural, functional aspects.
2. To develop a consensus of an experiment through a process of analysis of the situation, determination of the objectives, determination of the discipline which will be learned, determination of the measurement activities.
3. To give to the students the opportunity to discover correlations among materials.
4. To develop in the students an understanding of the means and methods for verification and validation of experimental outcomes.
5. To develop in the students an understanding of principles, methods, laws and how to apply them for the solution of technological problems. (p. 8)

The following emphases were identified in an effort to summarize the nature of technolgical education in Italy.

(1) identification of shapes and relationships,

(2) awareness of functional and aesthetic requirements,

(3) knowledge of materials and tools,

(4) development of child's personality

(5) fulfillment of self,

(6) association and relationship of subject matter,

(7) consensus through a process of analysis and determination in a practical sense,

(8) means and methods of experimental processes, and

(9) means and methods for solution of technological problems.

Spain. The study of technological education in Spain has a broad range of goals towards which it is directed. These involve such areas of student development as character, physical growth, integration of knowledge, analysis processes, appreciations, and understandings. Alcala (1980) listed nine different objectives for the study of technology in Spain. These objectives were --

to develop in the students . . .

1. good character, self control, as well as their physical characteristics,
2. the ability to integrate knowledge from single components,
3. the ability to understand and analyze the world of work,
4. ability to discover the socioeconomic and political aspects of a society dominated by technology,
5. critical capacity with respect to various technological phenomena,
6. ability to be part of a team,
7. an appreciation of the world of work,
8. ability to solve problems of the real world,
9. an understanding of materials, their function, and their impact on the culture of the technological society. (pp. 4,5)

An analysis of the objectives presented above for Spain would reveal a strong relationship between the human components and the requirements for living in a technological society. Some key words or components of these nine objectives are as follows:

- o character, self control
- o integration of knowledge
- o understanding and analysis
- o socioeconomic and political aspects
- o critical thinking
- o team involvement
- o appreciation
- o problem-solving
- o understanding of impacts on culture

United Kingdom. The teaching of technology in the United Kingdom takes on a broad range of practices as well as emphases. This is due to the fact that there is no single method for teaching and that the teachers enjoy a great deal of freedom in their programs of instruction. The relationship to other subject fields also varies widely. This point is made in a comment by Haines (1971) in which he discusses the divergencies in the teaching of technology.

> There is no standard method for teaching technology and teachers enjoy a large measure of freedom in deciding upon their approach to the pupil-centered activities followed in the workshops . . . . . Sometimes it may be closely associated with science, at other times with craft and often with other subjects, including history, mathematics and art . . . (p. 8)

The flexibility of the methodology as well as its pupil-centered activities provides the teacher with many opportunities for creative involvement with other disciplines and activities in the school.

The factors of individual pupil development, balance, and relevance are addressed in the programs of technological education in the United Kingdom. These concerns have led to a broad and encompassing role for technological education. This condition is described by Haimes (1971) in the following commentary on technological education in the United Kingdom:

> In order to ensure the full development of individual pupils, necessary knowledge, skills and attitudes must be imparted, and if the young person is to fit into society he needs some knowledge of his environment and of the society in which he lives. The school, too, seeks to impart certain ideals and aspirations, and, bearing in mind the increasing importance of leisure time, it also attempts to give opportunity for recreative and aesthetic activities. Such thinking leads to discussion of the balance between different elements of the curriculum, and in this context the question of technology is also relevant. Because it overlaps traditional subject boundaries and involves a number of subject disciplines, technology can give greater coherence and relevance to the curriculum as a whole. (p. 7)

In addition to the broad contextual relationships and purposes as described above, there are several specific aims for the study of technology in the schools. It is here where the programs of the United Kingdom take on a very unique and interesting emphasis. There is a great deal of concern for inventiveness, originality, and imagination. Stress is on planning, analyzing, and constructing and the methodological processes involved in each. Haimes (1971) has listed seven of these aims for technology in schools as per the following:

1. to encourage pupils to be inventive, and to produce original and imaginative work,
2. to help pupils analyze a new situation and decide upon the significant factors,
3. to help them (pupils) to apply their knowledge of principles and procedures in reaching a possible solution, or solutions,
4. to give experience in planning and constructing devices so conceived,
5. to train pupils to recognize the limitations of a design and to suggest modifications,
6. to promote confidence in the use of unfamiliar and possibly complex equipment,
7. to encourage pupils to keep faithful and methodical records, of failures as well as of successes. (p. 6)

The practices in the various schools throughout the country vary to a considerable extent. Thus, it is not possible to portray a typical school program or its emphases in the teaching of technology. However, Haimes (1971), in

his discussion of a number of the schools has identified a series of types of student activities in each that are imaginative, challenging, and relevant to the student as well as the society in which he/she will function. The following is a brief description of some of these student activities giving only the barest of information about each.

1. Investigating the beneficial and harmful effects of weed killers.
2. Experimenting with enzymes required the use of a colorimeter. The pupils constructed such an item.
3. Experimenting with several methods of forming shapes with plastic materials.
4. Producing a vacuum-forming machine for plastic sheet.
5. Using strain gauges in the study of structures.
6. Developing electrical methods for measuring small deflections.
7. Developing models of a linear induction motor.
8. Pursuing project work, including the making and testing of model aeroplanes, boats and devices of all types.
9. Analyzing the impact when a motorway is built through a rural area, vast changes are brought about in the ecology of the countryside and in village life.
10. Setting up a satellite tracking station. (pp. 13-15)

As one studies the report by Haimes (1971) on the study of technology in the schools of the United Kingdom, there are many themes or concerns that surface and merit our attention.

Some of these themes or concerns are as follows:

1. Emphasis on inventiveness, originality, and imagination.
2. Stress on planning, analyzing and constructing.
3. Application of knowledge and principles in the solution of relevant problems.
4. Use of experimental methods and good record keeping.
5. Concern for design limitations and modifications.

6. Allowance of freedom in program and methodology.
7. Emphasis on individual student development.
8. Integration of technology education with the other school subjects.
9. Inclusion of technology education in the concern for leisure and recreative activities.

West Germany. Technology education in West Germany is identified with the term "arbeitslehre".

> . . . according to "arbeitslehre" the teachers do not give constructive assignments to students, but the students nominate the aim of their projects. Further, the students associate their projects with the technical, economic and civic dimensions of the real world, applying a practical theoretical process which includes: planning, organization, calculation. (Eliadis, 1980, p. 3)

The stress is on the general education values of technology education with a strong emphasis on applying the practical processes of planning, organization and calculation. The importance of the general education thrust is seen in the emphasis on an understanding of the technical and socio-economic structure in the student's technological environment. This point is underscored in the comment by Eliadis (1980) in his discussion of the "arbeitslehre."

> "Arbeitslehre" does not train pupils for vocations. It is part of general education giving opportunities to the students to develop an understanding of the technical and socioeconomic structure of their technological environment. (p. 3)

The specific objectives of technology education (arbeitslehre) in West Germany range over several important areas of student development. These include coping with their environment; linkages with the social, technical and economic element; attitude development; and guidance purposes. Voelmy (1971) identified the following four objectives for technology education in West Germany.

1. to give pupils elementary technical education, to prepare them to cope with the technical side of their environment at work and

in the home.

2. to give pupils preliminary understanding of economic and social factors in the world of industry and work and to give them examples of the links between technical, economic, political and social elements.
3. to instill in pupils a proper attitude to work (determination, tenacity, open-mindedness, flexibility and adaptability, etc.) so that they can meet the requirements of their profession in co-operation with others.
4. to give pupils an opportunity for vocational guidance or to develop "vocational selection maturity" i.e., to enable them to make sensible choice of job. (p. 3)

An analysis of technology education in West Germany reveals an emphasis on the individual as well as the environment and the relationship of technology to the world beyond the school. Some concerns or themes that appear to run through the study of technology include:

1. Technology relationship with the economic, social, and political elements.
2. Practical theoretical applications.
3. Student coping ability.
4. Proper work attitudes.
5. Vocational guidance.

Trends and Areas of Agreement Among Representatives of Selected European Countries.

Although there are considerable differences among the numerous countries in Europe with respect to technology education or a program in technology education, there was some consensus at the 1980 conference held in Madrid. This conference was organized by the Council of Europe and had representatives from nine European countries, including: Austria, Cyprus, Federal Republic of Germany, Greece, Italy, Malta, Portugal, Spain, and Turkey. The participants agreed upon a number of ideas, some of which are as follows:

1. There are two trends regarding curriculums developed for technology. The first emphasizes the transfer to the students of specific knowledge and manipulative skills with respect to various technological areas (wood, metal, etc.).

   The second trend is based on the following ideas:

   a. Technology is the creation of an artificial world according to the needs and interests of society and the individual.

   b. Technology is subject to changes as a result of the rapid changes occurring in society and in the ecological environment.

   c. It is difficult for one to predict what specific technological knowledge could be usefully transferred to the pupils. (Eliadis,1980, p. 10)

The participants from the nine countries also agreed upon a series of ideas that relate to the direction or goals that a program in technology education should pursue. The following were selected from a series of twenty-four (24) items accepted by the participants.

2. Teaching of technology should emphasize planning, organization, and calculation.

3. Teaching of technology has to be different (than) the classical type of teaching, focusing on the needs, interests and development of the individual.

4. Discovery of the outside world must be emphasized.

. . . .

7. Teaching of technology will reflect the socioeconomic and political impact of the technical aspects of society and will contribute towards the development of values necessary for a citizen in a democratic technological society.

8. Teaching of technology should emphasize creativity on the part of the student.

. . . .

10. Teaching of technology should be compatible with the changing nature of the technological society.

11. Teaching of technology should be geared to the needs and interests of the students, as well as of society.

. . . .

20. There is a need for a clear distinction between general technological education and other forms of technical and non-technical education.

21. The prestige of the course of technology should be raised through the project approach and involvement of teachers from other disciplines.

. . . .

(Eliadis, 1980, pp. 11,12)

The nature of technology education in the European countries is such that it tends to be outside of the traditional subjects. This position brings with it a concern as to where and how it fits into the total educational picture, and how it relates to the more established disciplines. The picture in this regard differs from country to country and also within countries.

Mention has been made of the freedom that this newness and lack of traditional location in the system brings to the teaching of technology. This condition has been cited as an asset as well as a liability. However, as one studies the various reports and the purposes of technological education in the several European countries, there are numerous objectives, goals, and emphases that have considerable merit in the contemporary society. The emphases on individual development, relevance to the technological society, interdisciplinary functioning, inquiry and problem solving, and the gearing of technology education to the needs of the student are important thrusts that extend across disciplines as well as across national boundaries in a world society driven onward by an ever-changing technology.

MATERIALS CITED

(All of the materials cited were copies of reports developed for the Council of Europe, Commitee for Cultural Cooperation, except the paper by Paleocrassas and Eliadis.)

1. Alcala, M. "Technological education in Spain." Workshop for technology teachers training, Madrid, November, 1980, reports and proposals prepared by the Greek delegation. Strasbourg: Council of Europe Committee for Cultural Cooperation, Project No. 1, 1980.

2. Barbafiea, L. "Technological education in Italy." Workshop for technology teachers training, Madrid, November, 1980. Reports and proposals prepared by the Greek delegation. Strasbourg: Council of Europe Committee for Cultural Cooperation, Project No. 1, 1980.

3. Deforge, Y. (Ed.) The teaching of technology. Strasbourg: Council of Europe for Cultural Cooperation Committee for General and Technical Education, 1972.

4. Eliadis, N. "Council of Cultural Co-operation, the CCC's Project No. 1 'Preparation for Life' Countries of Southern Europe." Report and proposals prepared by the Greek Delegation for the Workshop on the Training of Teachers of Technological Education, Madrid, 17-20, November, 1980.

5. Haimes, A.A. "The teaching of technology in United Kingdom." In Deforge, Y. (Ed.) The teaching of technology. Strasbourg: Council of Europe for Cultural Cooperation Committee for General and Technical Education, 1971.

6. Paleocrassas, S.H., and Eliads, N. The introduction of elementary technology (industrial arts) into the curriculum of the Greek gymnasium: implementation problems and trends. Athens, Greece: KEME, 1981.

7. Payan, A. "The teaching of technology in France." In Deforge, Y. (Ed.) The teaching of technology. Strasbourg: Council of Europe for Cultural Cooperation Committee for General and Technical Education, 1971.

8. Trotta, A. "The teaching of technology in Italy." In Deforge, Y. (Ed.) The teaching of technology. Strasbourg: Council of Europe for Cultural Cooperation Committee for General and Technical Education, 1971.

9. Voelmy, W. "The teaching of technology (arbeitslehre) in the federal republic of Germany." In Deforge, Y. (Ed.) The teaching of technology. Strasbourg: Council of Europe for Cultural Cooperation Committee for General and Technical Education, 1971.